

CLAIMS:

1. A method for reliably transmitting a frame comprising the steps of:
inserting two or more sequence numbers in said frame, wherein each of said
two or more sequence numbers is associated with a destination node; and
transmitting said frame to two or more destination nodes.
2. The method as recited in claim 1 further comprising the step of:
inserting one or more bits in a frame header of said frame to select appropriate
ports in a switch fabric to transmit said frame.
3. The method as recited in claim 2 further comprising the step of:
setting a bit in said frame header of said frame to indicate an explicit or an
implicit acknowledgment.
4. The method as recited in claim 1 further comprising the step of:
saving a copy of said transmitted frame.
5. The method as recited in claim 1 further comprising the step of:
receiving an acknowledgment from a particular destination node of said two
or more destination nodes.
6. The method as recited in claim 5 further comprising the steps of:
identifying said particular destination node;
identifying a frame associated with said acknowledgment;
reading a data structure associated with said particular destination node; and
determining if a sequence number associated with said acknowledgment is
greater than an expected sequence number.

1 7. The method as recited in claim 6, wherein if said sequence number associated
2 with said acknowledgment is greater than said expected sequence number then the
3 method further comprises the step of:
4 detecting a lost acknowledgment.

1 8. The method as recited in claim 5 further comprising the steps of:
2 identifying said particular destination node;
3 identifying a frame associated with said acknowledgment;
4 reading a data structure associated with said particular destination node;
5 indicating in an entry in said data structure associated with said particular
6 destination node that a frame associated with said acknowledgment from said
7 particular destination node has been received; and
8 identifying a previous entry associated with a frame transmitted with an
9 implicit acknowledgment in said data structure associated with said particular
10 destination node as having been received.

1 9. The method as recited in claim 5 further comprising the steps of:
2 identifying said particular destination node;
3 identifying a frame associated with said acknowledgment;
4 reading a data structure associated with said frame associated with said
5 acknowledgment; and
6 indicating in an entry in said data structure associated with said particular
7 destination node that a frame associated with said acknowledgment from said
8 particular destination node has been received.

1 10. The method as recited in claim 9 further comprising the step of:
2 determining if there are outstanding responses for said frame associated with
3 said acknowledgment.

1 11. The method as recited in claim 10, wherein if there are outstanding responses
2 for said frame associated with said acknowledgment then the method further
3 comprises the step of:

4 waiting to receive an additional acknowledgment.

1 12. The method as recited in claim 10, wherein if there are no outstanding
2 responses for said frame then the method further comprises the step of:

3 releasing memory associated with said frame associated with said
4 acknowledgment.

1 13. The method as recited in claim 1 further comprising the step of:

2 receiving a request to retransmit said frame from a particular destination node
3 of said two or more destination nodes; and

4 retransmitting said frame to said particular destination node of said two or
5 more destination nodes.

1 14. The method as recited in claim 1, wherein said frame is a multicast frame.

1 15. A computer program product embodied in a machine readable medium for
2 reliably transmitting a frame, comprising:

3 programming operable for inserting two or more sequence numbers in said
4 frame, wherein each of said two or more sequence numbers is associated with a
5 destination node; and

6 programming operable for transmitting said frame to two or more destination
7 nodes.

1 16. The computer program product as recited in claim 15 further comprises:

2 programming operable for inserting one or more bits in a frame header of said
3 frame to select appropriate ports in a switch fabric to transmit said frame.

1 17. The computer program product as recited in claim 16 further comprises:

2 programming operable for setting a bit in said frame header of said frame to
3 indicate an explicit or an implicit acknowledgment.

1 18. The computer program product as recited in claim 15 further comprises:

2 programming operable for saving a copy of said transmitted frame.

1 19. The computer program product as recited in claim 15 further comprises:

2 programming operable for receiving an acknowledgment from a particular
3 destination node of said two or more destination nodes.

1 20. The computer program product as recited in claim 19 further comprises:

2 programming operable for identifying said particular destination node;

3 programming operable for identifying a frame associated with said
4 acknowledgment;

5 programming operable for reading a data structure associated with said
6 particular destination node; and

7 programming operable for determining if a sequence number associated with
8 said acknowledgment is greater than an expected sequence number.

1 21. The computer program product as recited in claim 20, wherein if said
2 sequence number associated with said acknowledgment is greater than said expected
3 sequence number then the computer program product further comprises:

4 programming operable for detecting a lost acknowledgment.

1 22. The computer program product as recited in claim 19 further comprises:

2 programming operable for identifying a frame associated with said
3 acknowledgment;

4 programming operable for reading a data structure associated with said
5 particular destination node;

6 programming operable for indicating in an entry in said data structure
7 associated with said particular destination node that a frame associated with said
8 acknowledgment from said particular destination node has been received; and

9 programming operable for identifying a previous entry associated with a
10 frame transmitted with an implicit acknowledgment in said data structure associated
11 with said particular destination node as having been received.

1 23. The computer program product as recited in claim 19 further comprises:

2 programming operable for identifying said particular destination node;

3 programming operable for identifying a frame associated with said
4 acknowledgment;

5 programming operable for reading a data structure associated with said frame
6 associated with said acknowledgment; and

7 programming operable for indicating in an entry in said data structure
8 associated with said particular destination node that a frame associated with said
9 acknowledgment from said particular destination node has been received.

1 24. The computer program product as recited in claim 23 further comprises:
2 programming operable for determining if there are outstanding responses for
3 said frame associated with said acknowledgment.

1 25. The computer program product as recited in claim 24, wherein if there are
2 outstanding responses for said frame associated with said acknowledgment then the
3 computer program product further comprises:
4 programming operable for waiting to receive an additional acknowledgment.

1 26. The computer program product as recited in claim 24, wherein if there are no
2 outstanding responses for said frame then the computer program product further
3 comprises:
4 programming operable for releasing memory associated with said frame
5 associated with said acknowledgment.

1 27. The computer program product as recited in claim 15 further comprises:
2 programming operable for receiving a request to retransmit said frame from a
3 particular destination node of said two or more destination nodes; and
4 programming operable for retransmitting said frame to said particular
5 destination node of said two or more destination nodes.

1 28. The computer program product as recited in claim 15, wherein said frame is a
2 multicast frame.

1 29. A node, comprising:

2 a processor; and

3 a memory unit coupled to said processor, wherein said memory unit is
4 operable for storing a computer program operable for reliably transmitting a frame,
5 wherein the computer program is operable for performing the following programming
6 steps:

7 inserting two or more sequence numbers in said frame, wherein each
8 of said two or more sequence numbers is associated with a destination node; and
9 transmitting said frame to two or more destination nodes.

1 30. The node as recited in claim 29, wherein the computer program is further
2 operable for performing the following programming step:

3 inserting one or more bits in a frame header of said frame to select appropriate
4 ports in a switch fabric to transmit said frame.

1 31. The node as recited in claim 30, wherein the computer program is further
2 operable for performing the following programming step:

3 setting a bit in said frame header of said frame to indicate an explicit or an
4 implicit acknowledgment.

1 32. The node as recited in claim 29, wherein the computer program is further
2 operable for performing the following programming step:

3 saving a copy of said transmitted frame.

1 33. The node as recited in claim 29, wherein the computer program is further
2 operable for performing the following programming step:

3 receiving an acknowledgment from a particular destination node of said two
4 or more destination nodes.

1 34. The node as recited in claim 33, wherein the computer program is further
2 operable for performing the following programming steps:
3 identifying said particular destination node;
4 identifying a frame associated with said acknowledgment;
5 reading a data structure associated with said particular destination node; and
6 determining if a sequence number associated with said acknowledgment is
7 greater than an expected sequence number.

1 35. The node as recited in claim 34, wherein if said sequence number associated
2 with said acknowledgment is greater than said expected sequence number then the
3 computer program is further operable for performing the following programming
4 step:
5 detecting a lost acknowledgment.

1 36. The node as recited in claim 33, wherein the computer program is further
2 operable for performing the following programming steps:
3 identifying said particular destination node;
4 identifying a frame associated with said acknowledgment;
5 reading a data structure associated with said particular destination node;
6 indicating in an entry in said data structure associated with said particular
7 destination node that a frame associated with said acknowledgment from said
8 particular destination node has been received; and
9 identifying a previous entry associated with a frame transmitted with an
10 implicit acknowledgment in said data structure associated with said particular
11 destination node as having been received.

1 37. The node as recited in claim 33, wherein the computer program is further
2 operable for performing the following programming steps:
3 identifying said particular destination node;

4 identifying a frame associated with said acknowledgment;
5 reading a data structure associated with said frame associated with said
6 acknowledgment; and
7 indicating in an entry in said data structure associated with said particular
8 destination node that a frame associated with said acknowledgment from said
9 particular destination node has been received.

1 38. The node as recited in claim 37, wherein the computer program is further
2 operable for performing the following programming step:

3 determining if there are outstanding responses for said frame associated with
4 said acknowledgment.

1 39. The node as recited in claim 38, wherein if there are outstanding responses for
2 said frame associated with said acknowledgment then the computer program is
3 further operable for performing the following programming step:

4 waiting to receive an additional acknowledgment.

1 40. The node as recited in claim 38, wherein if there are no outstanding responses
2 for said frame then the computer program is further operable for performing the
3 following programming step:

4 releasing memory associated with said frame associated with said
5 acknowledgment.

1 41. The node as recited in claim 29, wherein the computer program is further
2 operable for performing the following programming steps:

3 receiving a request to retransmit said frame from a particular destination node
4 of said two or more destination nodes; and

5 retransmitting said frame to said particular destination node of said two or
6 more destination nodes.

1 42. The node as recited in claim 29, wherein said frame is a multicast frame.

1 43. A system, comprising:
2 a transmitting node configured to transmit one or more frames of data;
3 a switch fabric coupled to said transmitting node configured to direct said
4 transmitted one or more frames of data;
5 a plurality of destination nodes coupled to said switch fabric, wherein each of
6 said plurality of destination nodes is configured to receive one or more of said one or
7 more frames of data; and
8 wherein said transmitting node comprises:
9 a processor; and
10 a memory unit coupled to said processor, wherein said memory unit is
11 operable for storing a computer program operable for reliably transmitting one or
12 more frames of data, wherein the computer program is operable for performing the
13 following programming steps:
14 inserting two or more sequence numbers in a frame of data,
15 wherein each of said two or more sequence numbers is associated with one of said
16 plurality of destination nodes; and
17 transmitting said frame of data to two or more of said plurality
18 of destination nodes.

1 44. The system as recited in claim 43, wherein the computer program is further
2 operable for performing the following programming step:
3 inserting one or more bits in a frame header of said frame of data to select
4 appropriate ports in said switch fabric to transmit said frame of data.

1 45. The system as recited in claim 44, wherein the computer program is further
2 operable for performing the following programming step:
3 setting a bit in said frame header of said frame of data to indicate an explicit
4 or an implicit acknowledgment.

1 46. The system as recited in claim 43, wherein the computer program is further
2 operable for performing the following programming step:
3 saving a copy of said transmitted frame of data.

1 47. The system as recited in claim 43, wherein the computer program is further
2 operable for performing the following programming step:
3 receiving an acknowledgment from a particular destination node of said two
4 or more destination nodes.

1 48. The system as recited in claim 47, wherein the computer program is further
2 operable for performing the following programming steps:
3 identifying said particular destination node;
4 identifying a frame of data associated with said acknowledgment;
5 reading a data structure associated with said particular destination node; and
6 determining if a sequence number associated with said acknowledgment is
7 greater than an expected sequence number.

1 49. The system as recited in claim 48, wherein if said sequence number associated
2 with said acknowledgment is greater than said expected sequence number then the
3 computer program is further operable for performing the following programming
4 step:
5 detecting a lost acknowledgment.

1 50. The system as recited in claim 47, wherein the computer program is further
2 operable for performing the following programming steps:
3 identifying said particular destination node;
4 identifying a frame associated with said acknowledgment;
5 reading a data structure associated with said particular destination node;

6 indicating in an entry in said data structure associated with said particular
7 destination node that a frame associated with said acknowledgment from said
8 particular destination node has been received; and

9 identifying a previous entry associated with a frame transmitted with an
10 implicit acknowledgment in said data structure associated with said particular
11 destination node as having been received.

1 51. The system as recited in claim 47, wherein the computer program is further
2 operable for performing the following programming steps:

3 identifying said particular destination node;
4 identifying a frame of data associated with said acknowledgment;
5 reading a data structure associated with said frame of data associated with said
6 acknowledgment; and

7 indicating in an entry in said data structure associated with said particular
8 destination node that a frame associated with said acknowledgment from said
9 particular destination node has been received.

1 52. The system as recited in claim 51, wherein the computer program is further
2 operable for performing the following programming step:

3 determining if there are outstanding responses for said frame of data
4 associated with said acknowledgment.

1 53. The system as recited in claim 52, wherein if there are outstanding responses
2 for said frame associated with said acknowledgment then the computer program is
3 further operable for performing the following programming step:

4 waiting to receive an additional acknowledgment.

1 54. The system as recited in claim 52, wherein if there are no outstanding
2 responses for said frame then the computer program is further operable for
3 performing the following programming step:

4 releasing memory associated with said frame of data associated with said
5 acknowledgment.